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Fruit bud formation—a criticism

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(WITH ONE TEXT FIGURE)

Early in 1915, I wrote as follows in Technical Bulletin No. 9, New Hampshire Experiment Station:

Writers in the eastern United States have commonly made the statement that fruit buds are never axillary in the apple such as occurs in the northwest, yet this method of producing fruit buds in the east is not uncommon. It has been observed by the writer throughout the eastern states on both old and young trees and with many varieties. Whether it has any significance or not, it might be noted that it was more common in the plot fertilized with an excess of nitrogen fertilizer than elsewhere in the orchard. While from a practical standpoint this method of fruit-bud production can be almost ignored, it is well worthy of record.

This position has been controverted by O. Butler in the Bulletin of the Torrey Botanical Club (44: 85-96. 1917), as follows:

A *fruit branch* is a leader in which the terminal and axillary buds in the upper two thirds or thereabouts of its length become flower buds during the season of its development (PLATES I, FIG. 2, and 2). The flower buds borne laterally on the leader have been described as formed axillary by D'Albret and by Gourley, though they are in reality borne terminally on almost sessile spurs (*lambourdes*). A close study during the first season of the buds from which the supposed axillary clusters arise will show that at the close of vegetation the buds are subtended by a rosette of leaves and are not in the axil of a single leaf. The buds are, therefore, terminal on sessile spurs and not axillary, as by definition an axillary bud is a bud borne in the axil of a leaf. Forney is also of this opinion for he states that "it often happens that the eyes of this season's leader become transformed at once into spurs, and flower perfectly the following year." In the apple the development of flower buds on fruit branches is not commonly met with and is said to occur only in very fertile trees, or trees weakened by transplantation or soil exhaustion.

I have recently reexamined material in our orchards and again find that fruit buds are formed as true axillary buds in abundance on many trees (see FIG. 1). Occasionally short spurs are formed on new growth as I think horticulturists were aware, but in no such abundance as the axillary buds. It is likely that Butler mistook the points of attachment of the larger bud scales for leaf scars as they resemble them somewhat after the blossom cluster has been out a short time. I am led to suggest this explanation as the

plates which he shows are illustrations of true axillary flower buds and not spurs as indicated in his text.

Practically the same statement is found in Technical Bulletin No. 10, New Hampshire Experiment Station, by Miss C. A.

Black, which adds to the importance of having the matter corrected. In the latter article the author states that "the few scars at the base of this inflorescence indicate that it is really terminal and not axillary." This would indicate that proper material was not at hand for examination, for where axillary flower buds are formed it is impossible to see more than the one large leaf scar and there is no possible point of attachment for other leaves to be found. Her statement that "such buds are few in number and of no vigorous growth" is also an error, although they often do "develop later than the usual terminal flower buds." A wrong interpretation is furthermore given of *pl. 33, f. 2*, of this bulletin. I would consider this figure to represent a two-year-old shoot and not a three-year-old one, for it is common to find a shoot develop from the flower cluster and develop as shown in this figure. In fact two such shoots often are found on the spur with an apple developing also.



FIG. 1. Axillary flower buds on the Wealthy apple.

In observing wild species of *Pyrus* and *Malus* at the Arnold Arboretum I have found the following list to form fruit buds in the axils of the leaves rather profusely:

- | | |
|-------------------------------------|---|
| <i>Malus pumila</i> Niedzwetzkyana | <i>M. baccata mandshurica</i> Schneid. |
| Schneid. | <i>M. baccata sanguinea</i> Hort. |
| <i>M. pumila apetalata</i> Schneid. | <i>M. baccata aurantiaca</i> Hort. |
| <i>M. baccata</i> Borkh. | <i>M. Soulardi</i> Britt. (<i>M. ioensis</i> |
| <i>M. baccata Jackii</i> Rehd. | × <i>M. pumila</i>) |

<i>M. astrachanica</i> Dum.-Cours	<i>M. floribunda</i> Sieb.
(<i>M. baccata</i> × <i>M. pumila</i>)	<i>M. Arnoldiana</i> Rehd. (<i>M. baccata</i> × <i>M. floribunda</i>)
<i>M. Sargentii</i> Rehd.	<i>M. spectabilis</i> Borkh.
<i>M. prunifolia</i> Borkh.	<i>M. Scheideckeri</i> Zabel (<i>M. flori-</i> <i>bunda</i> × <i>prunifolia</i>)
<i>M. prunifolia Rinki</i> Rehd.	(<i>M.M. Halliana</i> Koehne
<i>M. zumi</i> Rehd.	<i>baccata</i> × <i>M. spectabilis</i>)
<i>M. micromalus</i> Makino	<i>Pyrus ovoidea</i> Rehd.
<i>M. theifera</i> Rehd.	<i>P. phaeocarpa</i> Rehd.
<i>M. Sieboldii</i> Rehd. <i>calocarpa</i>	<i>P. betulaefolia</i> Bge.
Rehd.	<i>P. Bretschneideri</i> Rehd.
<i>M. cerasifera</i> Spach (<i>M. baccata</i> × <i>M. pumila</i>)	

This would indicate a tendency for original species to flower as above described, although in our cultivated varieties of *Malus pumila* Mill. the spur system of flowering is the common method and the axillary formation can be ignored as of no special commercial importance. It is of some interest to note that none of our American species of *Malus*, such as *M. coronaria*, *M. ioensis* and *M. angustifolia*, showed axillary flower buds, although the trees were blooming full. Whether this is always true, I cannot state.

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